NPL-U7-3-247-R10

Sweet-Edwards/EMCON, Inc.

Ground Water, Engineering, Waste Management, & Drilling Services

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August 23, 1988

RECEIVED 8/23/88

Stephen A. Lingle, Director
Hazardous SIte Evaluation Division
Office of Emergency and Remedial Response
U.S. Environmental Protection Agency
401 M Street Southwest
Washington, D.C. 20460

Re: NPL Nomination NPL-U7-227,
Pasco Sanitary Landfill

Dear Mr. Lingle:

Attached is Exhibit 9 to the comments you received earlier today, regarding the above-referenced matter.

Very truly yours,

Sweet-Edwards/EMCON, Inc.

Steven R. Sagstad

Steven R. Sagstad
Senior Hydrogeologist

SRS:kk
Attachment
Via Fax

Sweet-Edwards/EMCON, Inc.
Ground Water, Engineering, Waste Management, & Drilling Services

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August 23, 1988
Project No. S94-08.01

Ms. Leslie N?llei?m?e
Heller, Ehrman, White and McAuliffe
2400 Fourth & Blanchard
Seattle, WA 98121-2317

Re: Pasco Sanitary Landfill

Dear Leslie:

This letter responds to your questions regarding location of wells, beneficial users and contaminant modeling of the shallow aquifer downgradient of the Pasco Sanitary Landfill. The first portion of the letter deals with background data used in evaluating the aquifer of concern and addresses the "population served by ground water" issues. The remainder of the letter discusses alternate sources of water and describes results of modeling the movement of volatile organic compounds in the shallow aquifer.

Background Information

There are two aquifers under the site which are referred to as the shallow aquifer and basalt aquifer (Ecology and Environment; "Final Report for Resource Recovery Corporation, Pasco, Washington", 1986). A review of available reports, well logs from WDOE and U.S.G.S., and a brief site visit indicates nearly all wells utilizing ground water in the vicinity of the Pasco Landfill are screened in the shallow aquifer. Ground water flow in the shallow aquifer is to the southwest toward the City of Pasco and the Columbia River. (Figure 4.4, Ecology and Environment, 1986: attached).

Population Served Issue

Data is not sufficient to provide an absolute value on the number of people who utilize the shallow aquifer as a drinking water source downgradient of the landfill. A preliminary assessment of downgradient users has been undertaken. Downgradient users of ground water, including the closest well (i.e., the Tippett well located 1600 feet downgradient of monitoring well EE-3) and

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sixteen additional users of ground water, are estimated to include 460 people. Table 1 lists the downgradient users of ground water, which includes land area irrigated by wells converted to population. The location of downgradient wells is shown on the attached drawing. The following assumptions were used to determine ground water use downgradient of the landfill:

- The reported wells in the area were obtained from EPA reports and field verification of the location of the Tippett well.

- The downgradient area was limited to 3 to 5 square miles (see attached figure for downgradient area limits) based on an area that would be potentially impacted by the landfill.

- The population converted from irrigated acres includes an estimated 340 people, based on the 226.5 irrigated acres located downgradient of the landfill (1.5 people per acre).

- An additional 120 people utilizing domestic supplies of ground water were downgradient of the landfill.

Alternate Sources

Two alternate sources of water supply are available downgradient of the landfill. A deeper aquifer is present in the basalt underlying the shallow aquifer. The shallow and deep basalt aquifers are separated by layers of relatively low permeability "blue clay" and dense basalt. These layers restrict downward movement of contaminants, minimizing the change of deep percolation of volatile organic compounds. The depth to water bearing zones within the basalt is several hundred feet. Well yields in the Columbia Basin range from several hundred to over 1000 gallons per minute in the basalt aquifer. This deeper source of ground water could be used as an alternate source to the shallow aquifer.

A secondary source of supply is the Columbia River. The city of Pasco obtains its water supply from this source. Additional water supplies could be obtained from the Columbia River if needed.

Contaminant Transport Modeling

A numerical ground water transport model (Random Walk) was used to simulate the potential migration rate and decay of volatile organic compounds beneath the Pasco Sanitary Landfill site. The Random Walk model is based on the concept that dispersion in porous media is a random process. The program calculates particle distribution and concentration representing a contaminant solute. Model inputs include aquifer and transport parameters, sink and source data, particle generation (i.e., source simulation) specifications and simulation data. Basic model assumptions include:

- o A homogeneous and isotropic aquifer
- o Two dimensional flow
- o Slug source
- o No degradation

Site specific input values for aquifer parameters were derived from previous site investigation data (Ecology and Environment, 1986). Specific information on transport coefficients and source characteristics (dispersivity, retardation coefficient and initial contaminant concentrations) are not known, and were therefore obtained from current literature or estimates of site conditions (Freeze and Cherry, 1984; USEPA, 1984; Parson, Woods and DeMarco, 1984).

Model calibration was achieved by adjusting transport coefficients such that model concentration values at monitoring wells EE-3 and JUB-2 approached actual historical concentrations. The model was then allowed to run until contaminants appeared in the nearest downgradient private well (used only for irrigation) at approximately 1600 feet southwest of area A.

Previous investigations report aquifer flow rates are approximately 170 ft/year. Modeling results based on this flow rate and estimated retardation indicate a contaminant migration rate of between 60 and 80 feet per year, depending on longitudinal dispersivity values. In general, increasing the dispersivity value by an order of 10 increased the migration rate by approximately 30 percent and resulted in a more diffuse, less concentrated plume.

Four models were used in evaluating the impact of contaminant sources on the downgradient Tippett irrigation well (located approximately 1600 feet south of Area A). The first model, which approximates conditions of the site, and we therefore believe is the most realistic, was based on the following assumptions:

<u>Random Walk Assumptions</u>

Transmissivity (gpd/ft) = 100,000 gpd/ft
Storage Coefficient = .2
Hydraulic Conductivity = 1000 gpd/sq ft
Porosity = .3
Longitudinal Dispersivity (ft) = 30
Transverse Dispersivity (ft) = 3

Retardation Coefficient = 3.5
Regional X Flow (ft/day) = .5
Regional Y Flow (ft/day) = 0
Particle Mass (lbs) = .8
Initial Ground Water Contaminate Concentration = 5000 ppb

Decay Assumptions

2 year half life

Results utilizing decay assumptions in the above referenced model are that a predicted concentration of less than 1 ppb would initially reach the Tippett well after 9,125 days. This decay model assumes a 50 percent decay every two years (2 year half life). The predicted degradation of volatile organic compounds was based on studies by Parsons, et al, 1984 and Wilson, 1984.

The predicted contaminant concentrations in the above model assumes contaminant degradation will occur. However, if no degradation/decay of volatile organic compounds is assumed, which is not realistic based on studies noted above, a predicted concentration of 40 to 100 ppb would be present after 9,125 days in the Tippett well located 1600 feet downgradient of Area A.

Although SE/E believes the above referenced model with volatile organic degradation accurately describes the site conditions, a "worst case" or more conservative assumptions were utilized for a more conservative evaluation. For this evaluation, dispersivity values were decreased by 1/10th of the values utilized in the models described above. The assumptions were as follows:

Random Walk Assumptions

Transmissivity (gpd/ft) = 100,000 gpd/ft
Storage Coefficient = .2
Hydraulic Conductivity = 1000 gpd/sq ft
Porosity = .3
Longitudinal Dispersivity (ft) = 3
Transverse Dispersivity (ft) = .3
Retardation Coefficient = 3.5
Regional X Flow (ft/day) = .5
Regional Y Flow (ft/day) = 0
Particle Mass (lbs) = .8
Initial Ground Water Contaminant Concentration = 5000 ppb

Decay Assumptions

2 year half life

Results utilizing decay assumptions for the lower dispersivity model are that a predicted concentration of less than 1 ppb would initially reach the Tippett well in 10,190 days. These results do not change from the first model when utilizing a decay factor.

For the "worst case" model, assuming no decay and decreased dispersivity, the predicted concentration in 10,190 days would be 125 - 200 ppb in the irrigation well 1600 feet southwest of Area A. These conservative results (without decay) do not appear reasonable based on studies by Parsons, et al, 1984, and Wilson, 1984.

Actual observed contaminant conditions may vary considerably from modeled results depending on the source size and concentrations and the heterogeneity of the aquifer system. The present modeling efforts discussed above provide a reasonable starting point which can be refined as additional data becomes available. The model assumptions are not in conflict with existing information. We believe the above discussed assumptions are reasonable based on available data and can be used as a general guide in evaluating transport of contaminants from the Pasco Sanitary Landfill.

If you have any questions, please do not hesitate to call.

Very truly yours,

Sweet-Edwards/EMCON, Inc.

Steven Sagstad

Steven R. Sagstad
Senior Hydrogeologist

SRS:kk

BIBLIOGRAPHY

Ecology and Environment, Inc., Final Report for Resource Recovery Corporation, Pasco, Washington, June 1986, TDD R10-8410-14.

Parsons, F., P.R. Wood, and J. DeMarco, Transformations of Tetrachloroethene and Trichloroethene in Microcosms and Groundwater, Journal AWWA, Feb. 1984, p. 56.

Wilson, J.T., R.S. Kerr Environmental Laboratory, May 1984, Potential for Biodegradation of Organo-Chlorine Compounds in Groundwater; U.S. EPA, Ada, Oklahoma.

Table 1

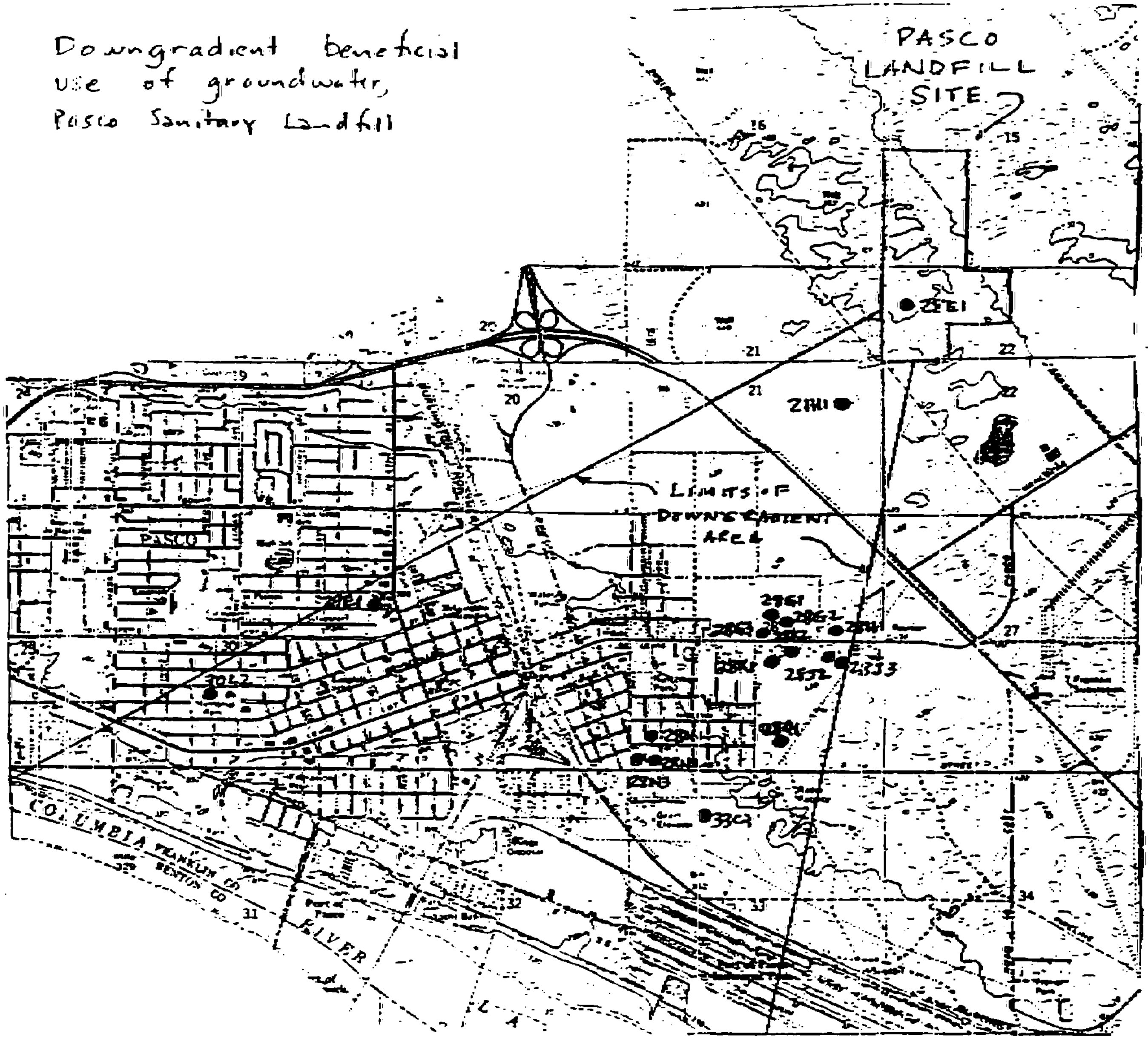
DOWNGRADIENT BENEFICIAL USERS

WELL NUMBER	NAME	ACRES	PEOPLE	USE
28G3	Al Yenney	n/a	3.8	D
28G2	Rada Sons	n/a	16.0	D
28G1	Aztlan Construction	n/a	20.0	D
28K1	Bonne Brae	n/a	65.0	D
28K1	Bumgardner	n/a	3.8	D
28H1	Dall	n/a	3.8	D
21H1	Tippett	80	120.0	I
28J3	Cunningham	n/a	3.8	D
28K2	Rassmussen	n/a	3.8	D
22E1	Dietrich	38	57.0	I
28J2	Spooner	1	1.5	D/I
28N1	Reisinger	2	3.0	D/I
28N2	Reisinger	6.5	9.75	D/I
28Q1	Mann	10	15.0	I
28N3	Johnson	5.5	8.25	D/I
29E1	Lourdes	0.5	0.75	D/I
30L2	City of Pasco	10	15.0	I
33G1	Story	73	109.5	I
	TOTAL:	146.5	460.0	

D = domestic

I = irrigated

Downgradient beneficial use of groundwater, Pasco Sanitary Landfill



Legend

● well

2833 well location

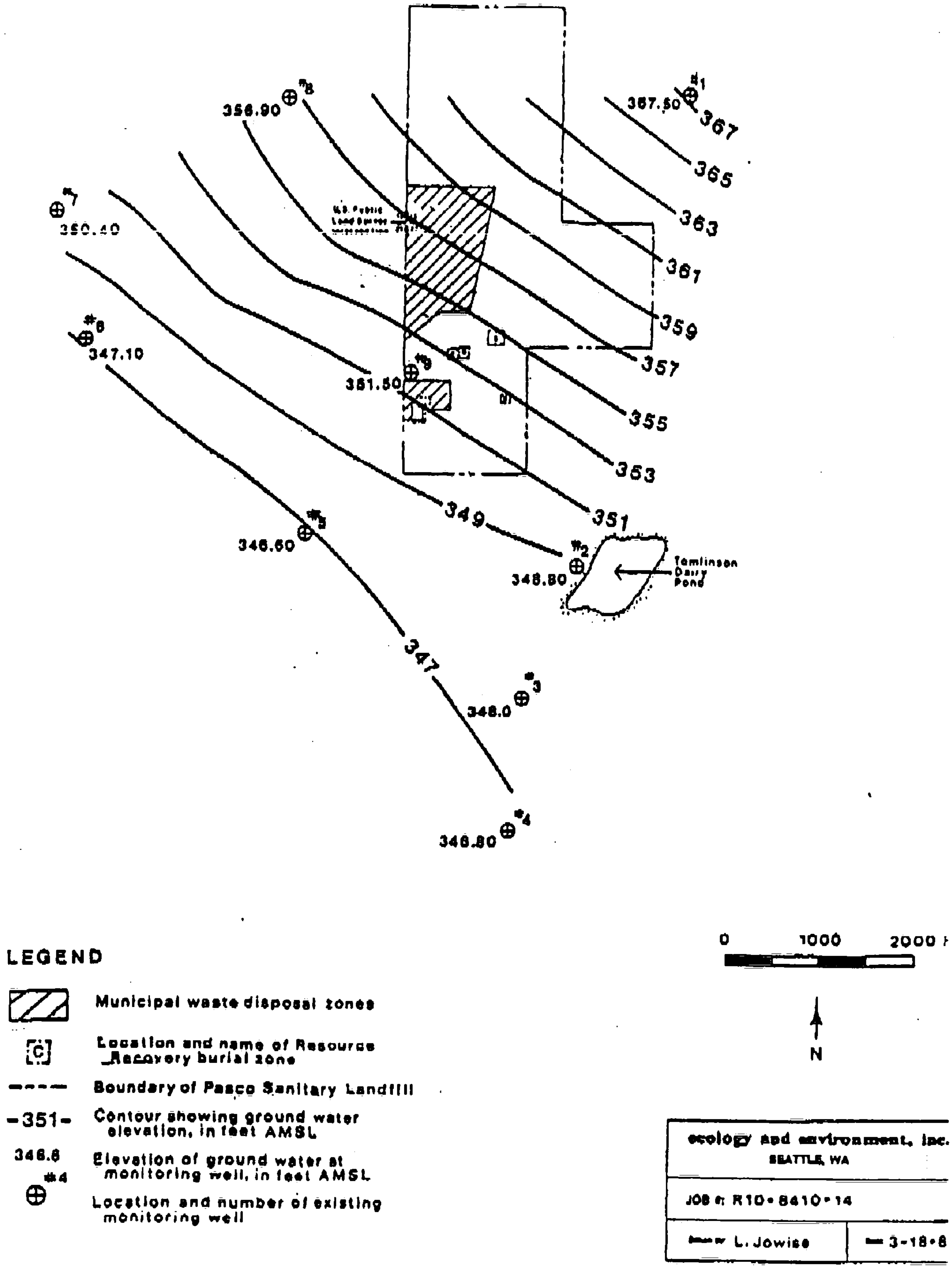


Figure 4.4 Contour map showing elevation of ground water, in feet AMSL, at Resource Recovery study area, on April 24-25, 1981, adapted from JUB report (15).

TELEFAX TRANSMITTAL

TO:
Stephen A. Lingle

NUMBER OF PAGES:
11- including cover

FROM:
Steven Sagstad

PHONE NUMBER: 382-7884
Fax # 202 ~~382-2078~~

SUBJECT:
Pasco Landfill

DATE:
8/23/88

Exhibit 9

SIGNED: Steve

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